

IN THE CLAIMS

1. (amended) A method of sequencing a plurality of target nucleic acids each comprising a first domain and an adjacent second domain, said second domain comprising a plurality of target positions, said method comprising:

a) provide an array comprising:

- i) a substrate with a surface comprising discrete sites; and
- ii) a population of microspheres comprising at least first and second subpopulations, distributed at discrete sites on a surface of a substrate;

E1 b) providing a first hybridization complex comprising said first domain of a first target sequence and a first sequence primer, wherein said first hybridization complex is attached to said first subpopulation;

c) providing second hybridization complex comprising said second domain of a second target sequence and a second sequence primer, wherein said second hybridization complex is attached to said second subpopulation;

d) simultaneously extending said first and second primers by the addition of a first nucleotide to a first detection position using a first enzyme to form first and second extended primer, respectively;

e) detecting the release of pyrophosphate (PPi) to determine the type of said first nucleotide added onto said first and second primers, respectively; and

f) determining the identity and location of each microsphere.

E2 4. (amended) A method according to claim 1 wherein said first and second hybridization complexes comprise:

- E2
COO⁺
- a) said first and second target sequences;
 - b) said first and second sequencing primers;
 - c) first and second capture probes, wherein said capture probes are covalently attached to said microspheres.
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10. A method of sequencing a plurality of target nucleic acids each comprising a first domain and an adjacent second domain, said second domain comprising a plurality of target positions, said method comprising:

E3

- a) a) providing first hybridization complex comprising a first target sequence and a first sequencing primer that will hybridize to the first domain of said first target sequence,

- b) providing a second hybridization complex comprising a second target sequence and a second sequencing primer that will hybridize to the second domain of said second target sequence, wherein said first and second sequencing primers are covalently attached to microspheres distributed on a surface of a substrate;

- b) determining the identity of a plurality of bases at said target positions, wherein said determining comprises simultaneously extending said first and second sequencing primers by the addition of a first nucleotide to a first detection position using a first enzyme to form first and second extended primers, respectively; and

- c) detecting the release of pyrophosphate (PPi) to determine the type of said first nucleotide added onto said first and second sequencing primers, respectively.

18. A kit for nucleic acid sequencing comprising:

- E4
- a) a composition comprising: